

# In-bottle measurement of variable bottle oxidation

## Background

Variable bottle oxidation is a problem encountered periodically by wineries. It can be particularly relevant to products that are aged in bottle before release.

Contributing issues can include:

- closure variability
- variation in oxygen exposure during packaging
- insufficient sulfur dioxide (SO<sub>2</sub>) levels at packaging
- transport and storage conditions, particularly extreme temperature variation

Typically, when such a problem is suspected, one or two dozen bottles of the particular wine are subjected to sensory assessment and/or chemical analysis. This would usually include measurement of free and total SO<sub>2</sub> for red or white wines, optical density at 420nm (OD<sub>420</sub> -yellow/brown colour development) for white wines and chemical age indices for red wines. Sensory results for the attribute 'oxidised' usually correlate well with the chemical measures of oxidation, so the chemical results are often used for screening without sensory data.

While sensory or chemical analysis of this type makes it fairly straightforward to identify a variable oxidation problem, wineries are still left with the difficult task of sorting saleable from unsaleable bottles. In most cases, this cannot be achieved visually through the bottle, so wineries must decide if the expense of opening, assessing and re-closing bottles is justified. Typically, whole batches of variably-affected wine are disposed of, causing the winery a significant loss.

This Fact Sheet presents two ways that a newly developed instrument (the BevScan) can be used to assist wineries in cases of variable oxidation, allowing easy and economical sorting of stock.

## What is the BevScan?

The BevScan is a new Visible/Near Infrared spectrometer developed in partnership between Jeffress Engineering Pty Ltd and the AWRI. It has been designed to spectrally scan wine through the sealed bottle without having to open it. More information about this instrument can be found in the AWRI Fact Sheet **Introducing BevScan – a new tool for non-destructive wine analysis and classification**.

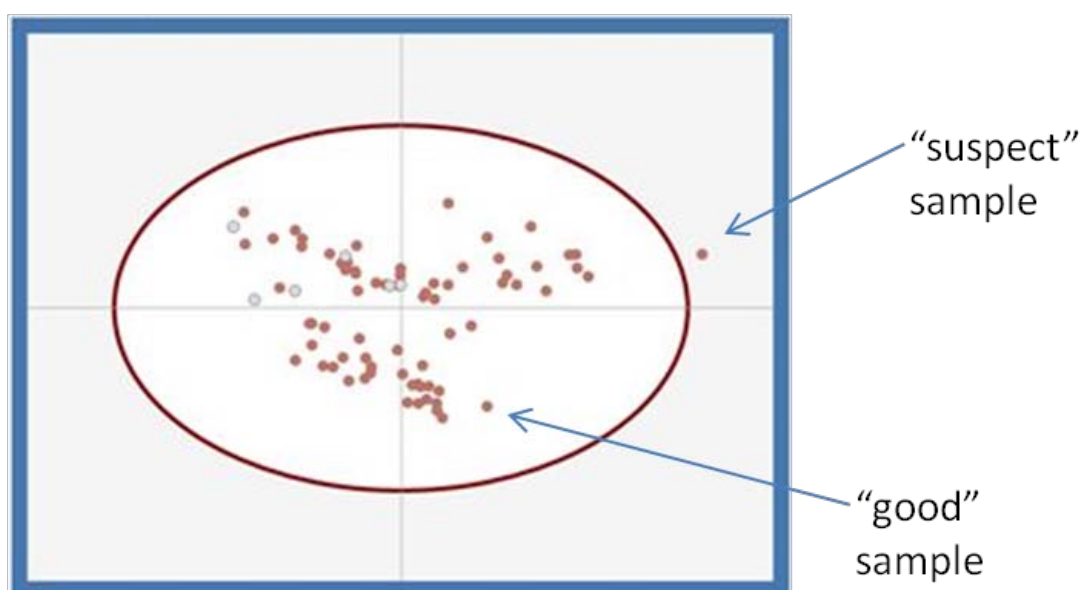


## Sorting wine using SIMCAL

The easiest way to use the BevScan to sort a batch of wine affected by variable oxidation is to use the SIMCAL mode. This is a simple function built into the BevScan software that allows users to sort bottled wine samples, based on their spectral properties, without the need for any expertise in statistics or calibration development. Users simply define a profile for a wine by scanning a number of known ‘good’ samples. The profile is represented visually on the display as an ellipse containing scattered dots. The ellipse represents the boundary of the profile and the dots represent the wines that have been scanned. Once a profile has been defined, additional bottles can be scanned and the software will quickly indicate whether or not they match the ‘good’ profile.

In a case of variable oxidation, an initial subset of bottles should be scanned in this mode. A preliminary indication of any groupings or outliers will then immediately be seen in the SIMCAL visual display. The initially scanned bottles should then be opened and tasted or analysed chemically to confirm which are ‘good’ and which have been affected by oxidation. The cut-off level for ‘good’ bottles can be entirely determined by the user’s requirements. Bottles shown to be affected by unacceptable levels of oxidation can then be removed from the wines used to define the profile (the SIMCAL), leaving only those found to be ‘good’. The profile is then recalculated, and ready to use as a basis of comparison for additional bottles.

All remaining bottles can then be quickly scanned and will be immediately classified as either matching the SIMCAL (inside the ellipse), and therefore ‘good’, or not matching the SIMCAL (outside the ellipse), and therefore ‘suspect’. Fast, non-destructive sorting of the oxidised from non-oxidised bottles is achieved without the need for any statistical expertise.



## Sorting wine using predictive mode

The BevScan's predictive mode can also be used to sort bottled wine in cases of variable oxidation – but doing so takes a little more technical expertise than using SIMCAL.

In order to use the predictive mode, a calibration must first be developed, to link the spectral data with a sensory or chemical indicator of oxidation (e.g. oxidation score, OD<sub>420</sub> etc.). This is achieved by scanning a subset of the bottles and then analysing them for the chosen oxidation indicator. Multiple regressions are then carried out on the combined data, using chemometrics software.

Once the calibration file has been generated, it can be dropped into the BevScan's internal software. New bottles of the affected wine can then be scanned and their oxidation rating or OD<sub>420</sub> value predicted, based on the previous results. The user can choose a cut-off value and use this to sort saleable from unsaleable bottles, quickly and non-destructively.

Predictive mode works well for this type of situation, and is particularly useful when samples are affected by varying degrees of oxidation. Adopting this approach does, however, require appropriate software and expertise in calibration development, either in-house or outsourced.

## Summing up

Sorting bottles of a wine affected by variable oxidation can be expensive and time-consuming if traditional destructive means are used. The BevScan offers a fast, reliable alternative – with two possible approaches, depending on the situation. Predictive mode gives the advantage of being able to assess the level of oxidation in each bottle, but requires greater resources in terms of calibration development skills. SIMCAL mode provides a quick yes/no answer and is accessible to users with no statistical background.

## Where can I find out more?

A general introduction to the BevScan can be found in the AWRI Fact Sheet: **Introducing BevScan - a new tool for non-destructive wine analysis and classification.**

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